

To Evaluate the Clinical Benefits of Platelet Rich Plasma When Injected Into The Intra-Articular Space Compared to A Corticosteroid**Arjun Jagadish Bhoomraddi¹, Jagadish V. Bhoomraddi², Mahantesh Patil³, Sudha⁴**¹Fellowship in Ganga Hospital, Dept. of Orthopaedics, Coimbatore, Tamil Nadu, India²Assistant Professor, Dept. of Orthopaedics, KHPIMS, Gadag, Karnataka, India³Professor & Head, Dept. of Orthopaedics, KHPIMS, Gadag, Karnataka, India⁴Postgraduate Resident, Department of Orthopaedics, K H PATIL Institute of Medical Sciences, Gadag, Karnataka, India

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Abstract:

The interplay between clinical and radiological outcomes thus forms a critical foundation for evaluating the true value of PRP and corticosteroid injections. Clinical improvement—in terms of pain reduction, stiffness relief, and functional enhancement—remains the metric most meaningful to patients. However, osteoarthritis is a disease with both symptomatic and structural dimensions. A therapy may provide excellent symptomatic benefit yet fail to influence the underlying architecture of the joint, while another may offer modest pain relief but significantly alter the biological environment in ways that slow cartilage degradation. By integrating clinical indices with radiological markers, a more complete and nuanced understanding of therapeutic efficacy can be achieved, particularly in a population where preventing further deterioration carries tremendous long-term implications

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Introduction

The age group of 45 to 65 years presents an especially important demographic for comparing these two modalities. These individuals are not yet at the threshold where joint replacement becomes the inevitable next step, but they are also beyond the early phases of the disease where lifestyle modification alone might suffice. Their radiological findings often reveal the first definitive signs of structural decline—joint space narrowing, osteophyte formation, and subchondral sclerosis—yet their daily responsibilities frequently demand a level of mobility that the disease begins to compromise.[1] This cohort therefore embodies a real-world clinical challenge: they require interventions that not only alleviate pain but preserve or enhance function, delay progression, and maintain independence during an active stage of life. Radiological evaluation becomes invaluable in this context, offering tangible markers of disease severity, progression, and response to therapy. While symptoms provide a subjective measure of patient experience, radiographs, ultrasound assessments, and MRI findings introduce an objective counterbalance, capturing subtle improvements or worsening that may not be immediately perceptible. [2,3]

The interplay between clinical and radiological outcomes thus forms a critical foundation for evaluating the true value of PRP and corticosteroid injections. Clinical improvement—in terms of pain reduction, stiffness relief, and functional enhancement—remains the metric most meaningful to patients. However, osteoarthritis is a disease with both symptomatic and structural dimensions. A therapy may provide excellent symptomatic benefit yet fail to influence the underlying architecture of the joint, while another may offer modest pain relief but significantly alter the biological environment in ways that slow cartilage degradation. By integrating clinical indices with radiological markers, a more complete and nuanced understanding of therapeutic efficacy can be achieved, particularly in a population where preventing further deterioration carries tremendous long-term implications. [3,4]

The comparative study of PRP and corticosteroid injections also reflects a broader, ongoing shift in the philosophy of osteoarthritis management. Historically, treatment revolved around symptom control—analgesics, anti-inflammatory medications, and physical therapy. But as increasing attention turns to modifying disease progression, treatments like PRP challenge the traditional

paradigm by seeking to alter the degenerative course rather than simply easing its consequences. For clinicians, the decision between offering PRP or corticosteroids often becomes a negotiation between immediate relief and potential long-term benefit. For patients, it reflects personal priorities, tolerance for uncertainty, and willingness to invest in therapies with evolving evidence. This dynamic underscores the need for robust, comparative evaluations grounded not only in theoretical mechanism but in observable, measurable outcomes. [4,5]

Within this framework, exploring the role of intra-articular PRP and corticosteroid injections in individuals aged 45 to 65 with knee osteoarthritis becomes more than an academic exercise—it becomes a necessary inquiry into tailored, age-appropriate care. This population stands at a life stage where maintaining musculoskeletal health significantly influences productivity, mental well-being, and overall quality of life. Understanding how these two interventions differ in onset of relief, durability of effect, and association with radiological changes can provide meaningful guidance for clinical decision-making. [5,6]

The aim of this study was to evaluate a comparative study to assess the role of clinical and radiological outcome of intra-articular injection of platelet rich plasma and corticosteroid in patients age between 45-65 years with knee osteoarthritis at a tertiary care centre.

Methodology

The study was designed as an observational, comparative study. Its primary aim was to compare the clinical and radiological outcomes between two intra-articular therapeutic interventions for knee osteoarthritis. The design was prospective and longitudinal, following participants over a defined

period to assess the evolution of their symptoms and joint structure.

Inclusion Criteria:

- Patients diagnosed with primary osteoarthritis of the knee for at least one year.
- Radiological evidence of Kellgren-Lawrence (KL) grade II or III osteoarthritis on standing X-rays taken within the last six months.
- Age between 45 and 65 years.
- Persistent symptoms despite conservative management, including physical therapy, oral NSAIDs, or hyaluronic acid injections.
- Patients who were not willing to undergo or were not immediate candidates for Total Knee Arthroplasty (TKA).
- Patients who provided written, informed consent to participate in the study.

Exclusion Criteria:

- Patients with a previous history of any surgical operation on the affected knee.
- Patients with a diagnosis of tumour, metastatic disease, or active local/systemic infection.
- Patients with uncontrolled diabetes mellitus, peripheral vascular disease, inflammatory arthritis (e.g., rheumatoid arthritis), post-traumatic arthritis, or metabolic arthritis (e.g., gout).
- Patients on any anti-platelet medication.
- Patients who had received any intra-articular injection (corticosteroid, hyaluronic acid, or PRP) in the affected knee within a period prior to enrolment (as specified by the protocol).
- Patients who did not provide consent or were unwilling to comply with the follow-up schedule.

Results

Table 5: Comparison of Outcome Measures in PRP Group

Variable	Baseline (Mean $\pm$ SD)	6 Months (Mean $\pm$ SD)	Mean Difference	t-value	p-value
VAS Score	6.69 $\pm$ 1.01	2.47 $\pm$ 0.47	4.22	46.41	<0.001*
WOMAC Total Score	57.50 $\pm$ 11.25	23.97 $\pm$ 5.11	33.53	36.91	<0.001*

Comparison of Outcome Measures in Corticosteroid Group: In the corticosteroid group, there was a statistically significant improvement in both pain and functional outcomes at 6 months compared to baseline ($p < 0.001$). The mean VAS score decreased from 6.84 ± 0.98 to 4.27 ± 0.69 , with a mean reduction of 2.57, indicating moderate pain relief. Similarly, the WOMAC total score declined

from 58.33 ± 10.68 to 38.83 ± 7.12 , with a mean reduction of 19.50, reflecting improvement in joint function. These findings suggest that corticosteroid injections are effective in reducing symptoms of knee osteoarthritis, although the magnitude of improvement is comparatively lower than that observed with PRP.

Table 6: Comparison of Outcome Measures in Corticosteroid Group

Variable	Baseline (Mean $\pm$ SD)	6 Months (Mean $\pm$ SD)	Mean Difference	t-value	p-value
VAS Score	6.84 $\pm$ 0.98	4.27 $\pm$ 0.69	2.57	45.75	<0.001*
WOMAC Total Score	58.33 $\pm$ 10.68	38.83 $\pm$ 7.12	19.50	35.57	<0.001*

Comparison of Improvement Between PRP and Corticosteroid Groups: The comparison of improvement between the PRP and corticosteroid groups demonstrated that the PRP group showed significantly greater reduction in both pain and functional scores at 6 months ($p < 0.001$). The mean reduction in VAS score was higher in the PRP group (4.22 $\pm$ 0.73) compared to the corticosteroid group (2.57 $\pm$ 0.45), with a mean difference of 1.65.

Similarly, the reduction in WOMAC total score was substantially greater in the PRP group (33.53 $\pm$ 7.32) than in the corticosteroid group (19.50 $\pm$ 4.42), with a mean difference of 14.03. These findings indicate that PRP therapy is significantly more effective than corticosteroid injection in improving pain and functional outcomes in patients with knee osteoarthritis.

Table 7: Comparison of Improvement Between PRP and Corticosteroid Groups

Variable	PRP Group (Mean $\pm$ SD)	Steroid Group (Mean $\pm$ SD)	Mean Difference	t-value	p-value
VAS Reduction	4.22 $\pm$ 0.73	2.57 $\pm$ 0.45	1.65	15.45	<0.001*
WOMAC Total Reduction	33.53 $\pm$ 7.32	19.50 $\pm$ 4.42	14.03	13.22	<0.001*

Comparison of Clinical Outcomes Between PRP and Corticosteroid Groups: The comparison of clinical outcomes between the PRP and corticosteroid groups revealed a highly significant difference ($\chi^2 = 130$, $p < 0.001$). All patients in the PRP group achieved excellent outcomes (100%), whereas none of the patients in the corticosteroid group achieved an excellent outcome. In the

corticosteroid group, 38.5% of patients had good outcomes and 61.5% had fair outcomes. These findings indicate a strong association between treatment modality and clinical outcome, demonstrating the superior effectiveness of PRP therapy over corticosteroid injections in patients with knee osteoarthritis.

Table 8: Comparison of Clinical Outcomes Between PRP and Corticosteroid Groups

Clinical Outcome	PRP Group (n=65)	Steroid Group (n=65)	χ^2 value	p-value
Excellent	65 (100%)	0 (0%)	130	<0.001*
Good	0 (0%)	25 (38.5%)		
Fair	0 (0%)	40 (61.5%)		
Total	65 (100%)	65 (100%)		

Comparison of Adverse Events Between PRP and Corticosteroid Groups: The comparison of adverse events between the PRP and corticosteroid groups showed no statistically significant difference ($\chi^2 = 0.10$, $p = 0.75$). The majority of patients in both groups did not experience any adverse events, with 90.8% in the PRP group and 92.3% in the

corticosteroid group reporting no complications. A small proportion of patients in both groups experienced mild adverse events, which were comparable between groups. These findings indicate that both PRP and corticosteroid injections are safe, with no significant difference in the incidence of adverse events.

Table 9: Comparison of Adverse Events Between PRP and Corticosteroid Groups

Adverse Events	PRP Group (n=65)	Steroid Group (n=65)	χ^2 value	p-value
None	59 (90.8%)	60 (92.3%)	0.1	0.75
Any adverse event	6 (9.2%)	5 (7.7%)		
Total	65 (100%)	65 (100%)		

Discussion

The present study demonstrated a clear and statistically significant superiority of platelet-rich plasma (PRP) over corticosteroid injections in improving both pain and functional outcomes in patients with knee osteoarthritis at six months. The magnitude of reduction in VAS scores and WOMAC total scores was significantly greater in

the PRP group compared to the corticosteroid group, with highly significant p-values. Furthermore, the categorical clinical outcome analysis revealed that all patients in the PRP group achieved excellent outcomes, whereas none of the patients in the corticosteroid group reached this level, with outcomes limited to good and fair categories. These findings collectively establish not only statistical

superiority but also clinically meaningful superiority of PRP over corticosteroids.

This observed superiority can be understood through the fundamentally different mechanisms of action of the two interventions. Corticosteroids primarily function as anti-inflammatory agents, providing symptomatic relief by suppressing inflammatory mediators within the synovial environment. While this leads to rapid improvement in pain, it does not address the underlying degenerative processes of osteoarthritis. In contrast, PRP exerts a multifaceted biological effect by delivering concentrated growth factors and cytokines that modulate inflammation, stimulate tissue repair, and enhance joint homeostasis. Rodríguez-Merchán described how PRP promotes anabolic processes within the joint by increasing the activity of growth factors such as TGF- β , PDGF, and VEGF, while simultaneously reducing inflammatory cytokines such as IL-1 β and TNF- α .⁷ This dual action allows PRP to not only alleviate symptoms but also influence the underlying disease process, thereby producing more sustained and substantial clinical improvement.

The superiority of PRP observed in the present study is strongly supported by existing comparative literature. Huang et al. demonstrated that while PRP and corticosteroid injections yield comparable improvements in the short term, PRP provides significantly better outcomes at longer follow-up intervals, particularly beyond three months.⁸ This temporal divergence aligns closely with the findings of the present study, where PRP showed markedly greater improvements at six months. Similarly, Elksniņš-Finogejevs et al. reported that although both PRP and corticosteroids produced similar short-term benefits, PRP demonstrated significantly superior outcomes in pain and function from 15 weeks onward and sustained these improvements up to one year. [9] These findings provide a clear explanation for the observed differences in outcome magnitude in the present study.

The results are further reinforced by high-level evidence from systematic reviews and meta-analyses. McLarnon and Heron reported that PRP injections provide significantly greater reductions in pain, stiffness, and functional impairment compared to corticosteroids at 3, 6, and 9 months, with the greatest effect observed at 6 months. [10] This corresponds precisely with the time point evaluated in the present study, further validating the superiority of PRP at medium-term follow-up. Additionally, Wang et al. demonstrated that PRP results in significantly greater reductions in VAS and WOMAC scores compared to corticosteroids across multiple time points, confirming its enhanced efficacy in both pain relief and functional improvement. [11]

Network meta-analysis data also support these findings. Xue et al. reported that PRP ranks highest among intra-articular therapies for reducing pain, stiffness, and functional impairment, outperforming corticosteroids, hyaluronic acid, and other biologics. [12] The superior ranking of PRP across multiple outcome domains highlights its comprehensive therapeutic impact, which is reflected in the present study through both quantitative score reductions and qualitative clinical outcomes.

An important observation in the present study is the complete absence of excellent outcomes in the corticosteroid group, despite statistically significant improvements in VAS and WOMAC scores. This highlights a critical distinction between statistical improvement and clinical meaningfulness. While corticosteroids reduce symptom severity, the extent of improvement may not be sufficient to restore optimal functional status. In contrast, PRP not only reduces symptoms but appears to enable patients to achieve near-normal functional levels, as reflected by the 100% excellent outcome rate. This suggests that PRP may have a greater impact on overall joint performance and quality of life.

The superiority of PRP can also be attributed to its influence on multiple components of the osteoarthritic joint. PRP enhances synovial fluid quality by increasing hyaluronic acid production, improves cartilage metabolism through stimulation of chondrocyte activity, and may influence subchondral bone remodeling. These effects collectively contribute to improved joint biomechanics and reduced nociceptive stimulation. In contrast, corticosteroids primarily target synovial inflammation and have limited influence on cartilage integrity or joint lubrication. This difference in scope of action explains why PRP produces more comprehensive improvements in both pain and function.

Conclusion

While corticosteroid injections provide moderate and rapid symptomatic relief through suppression of synovial inflammation, their effects are largely transient and do not address the underlying degenerative processes of osteoarthritis. In contrast, PRP exerts a multifaceted biological effect by delivering a concentrated pool of growth factors and cytokines that modulate inflammation, promote tissue repair, and enhance joint homeostasis. This results in not only greater reduction in pain but also substantial improvement in joint function, as reflected by significantly better VAS and WOMAC scores.

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